

# PATENT ABSTRACTS OF JAPAN

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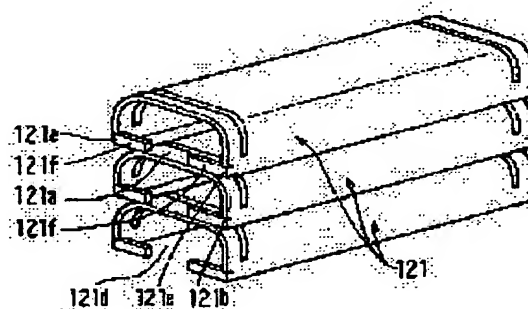
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## (54) METHOD FOR MANUFACTURING HEAT EXCHANGER

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a method for manufacturing a heat exchanger, for improving working efficiency in a manufacturing method for successively assembling by taking out a plurality of tanks, when assembling a heat exchanger by preparing the tanks where the section is of a U shape and the sidewall surface of the end part in the longitudinal direction is not formed while they are stacked and arranged in advance.

**SOLUTION:** A projection piece 121f, projecting from at least one opening end part 121e of an opening 121d that opens in a U shape of a tank 121 is provided, and a projection piece 121f and an upper wall surface 121a of another tank 121 are brought into contact with each other for stacking. A projection length L of the projection piece 121f is increased, as compared with a radius of curvature R. Also, the projection piece 121f is provided at the end part in the longitudinal direction at a side, where the sidewall surface of the end part in the longitudinal direction is not formed out of the open-end part 121e.



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CLAIMS

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[Claim(s)]

[Claim 1] A cross section constitutes the shape of a typeface of KO, and opening (121d) which carries out opening of the tank (121) by which at least one side of the side-attachment-wall side of a longitudinal direction edge is not formed to the shape of a typeface of KO is turned down. The receipt fixture (200) is prepared in advance in the form accumulated one by one. At the time of attachment of a heat exchanger (100) [ two or more ] It is the manufacture approach of the heat exchanger which attaches said tank (121) to drawing and said heat exchanger (100) from said receipt fixture (200). The piece (121f) of a protrusion which projects towards the inside of said opening (121d) from one [ at least ] open end (121e) of said opening (121d) of said tank (121) is prepared. The manufacture approach of the heat exchanger characterized by making said piece (121f) of a protrusion, and the upper wall side (121a) of said other tanks (121) contact, and making it accumulate.

[Claim 2] The wire extension (L) of said piece (121f) of a protrusion is the manufacture approach of a heat exchanger according to claim 1 that a cross section is characterized by making it larger than the radius of curvature (R) of the cross-section corner of said tank (121) of the shape of a typeface of KO.

[Claim 3] Said piece (121f) of a protrusion is the manufacture approach of a heat exchanger given in either claim 1 characterized by being prepared in the near longitudinal direction edge in which the side-attachment-wall side of a longitudinal direction edge is not formed among said open ends (121e), or claim 2.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Field of the Invention]** This invention relates to the manufacture approach of tank attachment for example, in the heat exchanger for cars.

**[0002]**

**[Description of the Prior Art]** As the conventional heat exchanger is shown in drawing 1, fitting of the tank 121 is carried out to the core section 110 which consists of a fin 111, a tube 112, a side plate 113, and a sheet metal 114, and what was soldered by one is known. By JP,7-159078,A, in order to reduce the excess metal section (scrap part) produced in the tank periphery section with deep-drawing shaping as much as possible and to make the cost of materials cheap, the tank 121 is fabricated by bending of the Taira plate, a cross section constitutes the shape of a typeface of KO, and what is blockaded with end plates 122 and 123, without forming a side-attachment-wall side in a longitudinal direction edge is shown.

**[0003]** usually, the inside of the receipt fixture which regulates the location of a longitudinal direction and the cross direction in the production process of a tank 121 after being fabricated by press working of sheet metal — one by one — predetermined number \*\*\*\* raising \*\*\*\*. And the tank 121 accumulated in this receipt fixture is taken out, it attaches to the core section 110, and a heat exchanger is manufactured by soldering by one.

**[0004]**

**[Problem(s) to be Solved by the Invention]** However, after press working of sheet metal, as shown in drawing 9, when it is the tank 121 by which the side-attachment-wall side of a longitudinal direction edge is not formed, when making it accumulate and align, engagement with open end 121e of the shape of a typeface of KO of the upper tank 121 and side-attachment-wall side 121b of the lower tank 121 arises with the weight of the tank accumulated on longitudinal direction the springback and the bottom of side-attachment-wall side 121b. For this reason, the ejection activity like tank impression plaster becomes difficult, and there is a problem that workability gets worse.

**[0005]** The purpose of this invention is in the manufacture approach which prepares in advance the tank by which a cross section has the shape of a typeface of KO, and the side-attachment-wall side of a longitudinal direction edge is not formed in view of the above-mentioned problem in the form which accumulated more than one and was aligned, takes out at the time of attachment of a heat exchanger, and is attached one by one to offer the manufacture approach of the heat exchanger which can improve attachment workability.

**[0006]**

**[Means for Solving the Problem]** This invention adopts the following technical means, in order to attain the above-mentioned purpose.

**[0007]** In invention according to claim 1, a cross section constitutes the shape of a typeface of KO, and opening (121d) which carries out opening of the tank (121) by which at least one side of the side-attachment-wall side of a longitudinal direction edge is not formed to the shape of a typeface of KO is turned down. In the manufacture approach of the heat exchanger which prepares the receipt fixture (200) in advance in the form accumulated one by one, and attaches

a tank (121) to drawing and a heat exchanger (100) from a receipt mixture (200) at the time of attachment of a heat exchanger (100) [ two or more ] The piece (121f) of a protrusion which projects towards the inside of opening (121d) from one [ at least ] open end (121e) of opening (121d) of a tank (121) is prepared. It is characterized by making this piece (121f) of a protrusion, and the upper wall side (121a) of other tanks (121) contact, and making it accumulate.

[0008] Thereby, when accumulating a tank (121), by the piece (121f) of a protrusion, engagement with the open end (121e) of a top tank and the side-attachment-wall side (121b) of the longitudinal direction of a bottom tank can be prevented, the ejection activity of a tank (121) becomes easy at the time of attachment by the heat exchange section (110), and workability can be improved.

[0009] And in invention according to claim 2, it is characterized by a cross section making the wire extension (L) of the piece (121f) of a protrusion larger than the radius of curvature (R) of the cross-section corner of the tank (121) of the shape of a typeface of KO.

[0010] Thereby, when accumulating a tank (121), since the piece (121f) of a protrusion can be put on the horizontal level of the upper wall side (121a) of a bottom tank, it can align in the vertical direction certainly and can improve the workability at the time of tank ejection.

[0011] Moreover, in invention according to claim 3, it is characterized by preparing the piece (121f) of a protrusion in the near longitudinal direction edge in which the side-attachment-wall side of a longitudinal direction edge is not formed among open ends (121e).

[0012] Thereby, since the piece (121f) of a protrusion can be put on the upper wall side (121a) of the four corners of other tanks (121), it can be stabilized, can accumulate a tank (121) and can improve the workability at the time of tank ejection.

[0013] In addition, the sign in the parenthesis of each above-mentioned means shows correspondence relation with the concrete means given in an operation gestalt mentioned later.

[0014]

[Embodiment of the Invention] (The 1st operation gestalt) The tank for a heat exchanger and heat exchangers and its manufacture approach of this invention are explained based on drawing 1 - drawing 5.

[0015] Drawing 1 and drawing 2 are drawings having shown the heat exchanger body. This heat exchanger 100 is a heater core which is constituted as a heat exchanger made from the aluminum, is prepared in the air conditioning system for cars, is made to carry out heat exchange of the hot engine cooling water which was able to be warmed with the engine (not shown), and the air which flows the inside of a fan duct (not shown), and heats air.

[0016] The laminating of two or more tubes 112 with which the engine cooling water flowed the interior and the core section 110 of the heater core 100 was formed in the shape of [ flat ] tubing, and the corrugated fin (following fin) 111 for having many louvers inside and raising the heat exchange engine performance is carried out by turns. And as a reinforcement member, the cross section constituted the shape of a typeface of KO in the both-sides side of the outermost train fin 111, and equips it with the side plate 113 which has heights 113a to longitudinal direction both ends. Furthermore, the sheet metal 114 is formed in the both ends in the longitudinal direction of a tube 112. As for a sheet metal 114, a cross section constitutes the shape of a typeface of KO, tube hole 114a and plate hole 114b are prepared, and heights 113a of the edge of a tube 112 and a side plate 113 has fitted in.

[0017] It is prepared in the both ends of the core section 110 so that a tank 121 (detail after-mentioned) may fit into a sheet metal 114, and opening of the longitudinal direction edge of a tank 121 is blockaded with the plate-like end plates 122 and 123. Furthermore, fitting of the pipe 130 is carried out to pipe hole 122a prepared in the end plate 122.

[0018] The above-mentioned fin 111 and the pipe 130 consist of aluminum raise in basic wages material (A3000 system) which has not carried out the clad of the wax material. Other members (112, 113, 114, 121, 122, 123) Both sides of an aluminum core material (A3000 system), It is, and it is, and it consists of aluminum clad plates which carried out the clad of the wax material (A4000 system) to one side which will be stretched, and which is attached and carried out, and it is joined [ the heater core 100 is supplied in a hot furnace, and ] by soldering by one. (The detail of the manufacture approach is mentioned later)

Here, the detail of the tank 121 used as the important section of the invention is explained. As shown in drawing 3, a cross section constitutes the shape of a typeface of KO, and the tank 121 has 121d of openings which carry out opening to the shape of a typeface of KO, and is formed from upper wall side 121a and side-attachment-wall side 121b of a longitudinal direction. As for the both sides of a longitudinal direction edge, the thing and \*\*\*\* cage in which the side-attachment-wall side is not formed, and 121g of slit holes with which end plates 122 and 123 are inserted near the longitudinal direction edge are prepared. From double door opening edge 121e of the shape of a typeface of KO of both the longitudinal direction edge, it is formed so that 121f of flanges which accomplish a projection and the piece of a protrusion towards the inside of 121d of openings may constitute bilateral symmetry. And he is trying for wire extension [ of 121f of this flange ] L to change for a long time than the radius of curvature R of the cross-section corner of the tank 121 of the shape of a typeface of KO. In addition, he prepares the infeed of 121h in the root section of 121f of flanges, and is trying to be settled by the amount of board thickness of 121f of flanges inside a tank 121.

[0019] Next, the manufacture approach of the heater core 100 of this invention is explained based on drawing 4 and drawing 5. Drawing 4 shows a series of processes until it really results [ from processing with the item of the heater core 100 ] in soldering. (a) shows the roller forming cycle which fabricates the wave-like fin 111 from the strip material of thin meat, (b) shows the roller forming cycle which fabricates a tube 112 from the strip material of thin meat, (c) shows the roller forming cycle which fabricates a side plate 113 from strip material, and (d) shows punching of the Taira plate, and the press-forming process which fabricates a sheet metal 114 by bending processing.

[0020] (e) shows the process which assembles \*\*\*\*\* and the core section 110 for the above-mentioned each part article 111, 112, 113, and 114. Specifically the laminating of a fin 111 and the flat tube 112 is carried out by turns, a side plate 113 is attached to the vertical both ends of the layered product, it is inserted in two or more tube hole 114a and plate hole 114b by which burring of the heights 113of both-ends [ of two or more tubes 112 ] and side plate 113 a was carried out to the sheet metal 114, and trial fitting attachment of the core section 110 is completed. In addition, since the core section 110 expands in the direction of a laminating of a tube 112 (the juxtaposition direction) with the elasticity of a fin 111 and a tube 112 etc. at the time of trial fitting attachment before soldering, it holds the configuration of the core section 110 with fixtures, such as a band and a wire.

[0021] the magazine 200 as a receipt fixture which, on the other hand, shows the tank 121 which (f) shows punching of the Taira plate, and the press-forming process which fabricates a tank 121 by bending processing, and was fabricated to drawing 5 in which the press machine was formed caudad — sequential sorting — it is supplied. A magazine 200 consists of two or more guide rods 230 which regulate the longitudinal direction side of a tank 121, and the location of a cross direction side periphery between the superior lamella 210 which has two or more injection holes 211, and the inferior lamella 220 which has the injection hole 211 and the extrusion hole 221 of the same number. In addition, the dashboard 240 which was united with the guide rod 230 so that injection correspondence could be performed also to the various tanks by which the dimensions of the longitudinal direction of a tank 121 differ is formed. This dashboard 240 enables it to correspond to the various tanks by which the dimensions of a longitudinal direction differ by carrying out adjustable [ of the setting location ] (housekeeping) in the direction of X.

[0022] After press forming of the tank 121 is carried out by (f), one by one, from the injection hole 211 of a magazine 200, it is thrown in one [ at a time ] and accumulated. If the tank 121 of a predetermined number is thrown in in one injection hole 211, it moves to the following injection hole 211 further, and it will be supplied until it grows into a full load in one magazine 200.

[0023] And the magazine 200 with which the tank 121 was carried a full load of it moves like the tank ejection impression plaster of (g). Here, the upper tank 121 is picked out one by one from the injection hole 211 by the robot hand, and fitting is carried out to the sheet metal 114 of the core section 110 assembled above (e). If one tank 121 is taken out, the lower tank 121 rises one by one only for tank height H minutes, the chuck of the following tank 121 is carried out by the robot hand, and ejection attachment is carried out by the lift rise device which was prepared in

the magazine 200 bottom and which is extruded and is not illustrated from a hole 221.

[0024] Furthermore, fitting of end plates 122 and 123 and the pipe 130 is carried out to 121g of slit holes, and pipe hole 122a at the process with a components group of (h), and attachment of the heater core 100 whole in a temporary fixed condition is completed.

[0025] (i) is a process which the flux which makes soldering nature good is made to blow off from Nozzle A, and applies it to the heater core 100 completed with [ this ] the group. This flux plays the role which prevents reoxidation within the heating furnace B for soldering mentioned later while removing the oxide film which checks soldering of the aluminum from each part article front face of the heater core 100. The flux adhering to front faces, such as upper wall side 121a of a tank 121 and side-attachment-wall side 121b, may be removed with the brush, aspirator, etc. Thereby, the amount of the flux which remains in the front face of tank 121 grade decreases.

[0026] (j) shows the process which really solders the heater core 100 whole by carrying in the above-mentioned heater core 100 by Conveyor C in a heating furnace B, and heating the heater core 100 to the predetermined temperature more than the melting point of wax material within a heating furnace B. The heater core 100 really [ this ] shown in drawing 1 by soldering is completed.

[0027] From the above configuration and manufacture approach, the operation effectiveness of this operation gestalt is explained below. In that by which a side-attachment-wall side is not formed in the longitudinal direction edge of a tank 121, since 121f of flanges is prepared In the time of the tank injection to the magazine of the above-mentioned production process (f) a tank 121 As shown in drawing 6 , 121f of flanges can serve as the form where it rides on upper wall side 121a of a lower tank, engagement with open end 121e of an upper tank and side-attachment-wall side 121b of a lower tank can be prevented, and it can stabilize and accumulate in the condition of having aligned.

[0028] Thereby, it sets like the tank ejection impression plaster of the above-mentioned production process (g), and a robot hand can carry out the chuck of the tank certainly each time, and an ejection activity becomes easy and can improve workability.

[0029] (Other operation gestalten) You may make it prepare 121f of flanges prepared in a tank 121 in either of the open end 121e, as shown in drawing 7 (a). If wire extension [ of 121f of flanges ] L is made longer than the radius of curvature R of a cross-section corner, the same effectiveness as the above-mentioned 1st operation gestalt will be acquired.

[0030] As shown in drawing 7 (b), 121f of flanges may be prepared so that it may become a field parallel to upper wall side 121a. And you may make it prepare this flange 121f in the pars intermedia (not shown) of the longitudinal direction of a tank 121.

[0031] Moreover, it can also prevent a tank 121 that the case where only one side is not formed is sufficient, and a tank 121 inclines to a longitudinal direction when a tank 121 is accumulated by preparing in the near longitudinal direction edge in which a side-attachment-wall side is not formed in 121f of flanges in this case, and its side-attachment-wall side of a longitudinal direction edge can improve the workability in a tank ejection process.

[0032] In the case of the handicraft process by people's hand, although it explained like the tank ejection impression plaster of (g) as a process by the robot hand, it is applicable similarly with the above-mentioned 1st operation gestalt.

[0033] Furthermore, although this operation gestalt explained based on the heater core which heats air, the capacitor which cools the radiator which cools an engine cooling water, and the refrigerant in a refrigerating cycle is applicable also to other heat exchangers.

[0034] In addition, the joint pipe 140 which has wall section 140a as it changes into the above-mentioned plate-like end plates 122 and 123 and is shown in drawing 8 is sufficient as the member which blockades a tank longitudinal direction edge side. Incidentally, in the joint pipe 140, it can set up by preparing burring section 140b which carries out opening, without making small the bore side cross-sectional area of a pipe 130 so that height H of a tank 121 may spread towards a pipe 130 side, when small, and the increment in water flow resistance of the engine cooling water which flows the interior can be prevented.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing the whole heater core in the 1st operation gestalt of this invention.

[Drawing 2] It is the decomposition perspective view in which it is shown near the tank in drawing 1 .

[Drawing 3] It is the perspective view showing the tank in the 1st operation gestalt of this invention.

[Drawing 4] It is outline process drawing showing the manufacture approach of the heater core in the 1st operation gestalt of this invention.

[Drawing 5] It is the perspective view showing the magazine for a tank injection in the 1st operation gestalt of this invention.

[Drawing 6] It is the perspective view showing the condition of having accumulated the tank in the 1st operation gestalt of this invention.

[Drawing 7] (a) which shows the tank in the operation gestalt of others of this invention is a modification 1, and (b) is the perspective view of a modification 2.

[Drawing 8] It is the perspective view of a modification 3 in which it is shown near the tank in the operation gestalt of others of this invention.

[Drawing 9] It is the perspective view showing the engagement condition at the time of tank \*\*\*\* raising in the conventional technique.

[Description of Notations]

100 Heater Core (Heat Exchanger)

110 Core Section (Heat Exchange Section)

121 Tank

121a Upper wall side

121d Opening

121e Open end

121f Flange (piece of a protrusion)

200 Magazine (Receipt Fixture)

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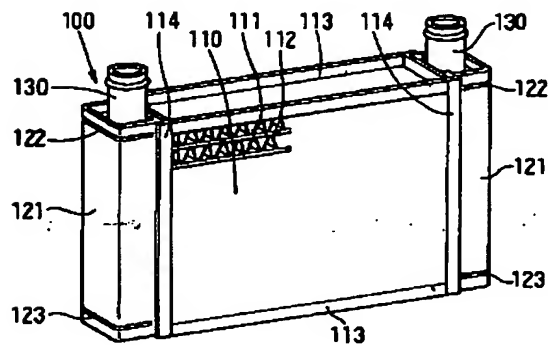
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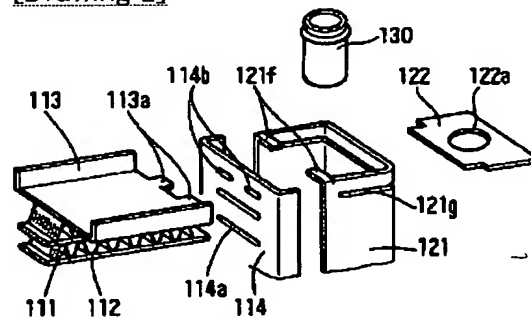
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## DRAWINGS

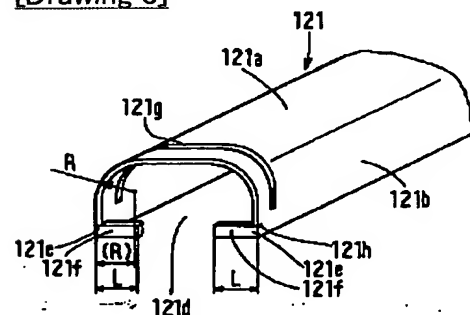
[Drawing 1]



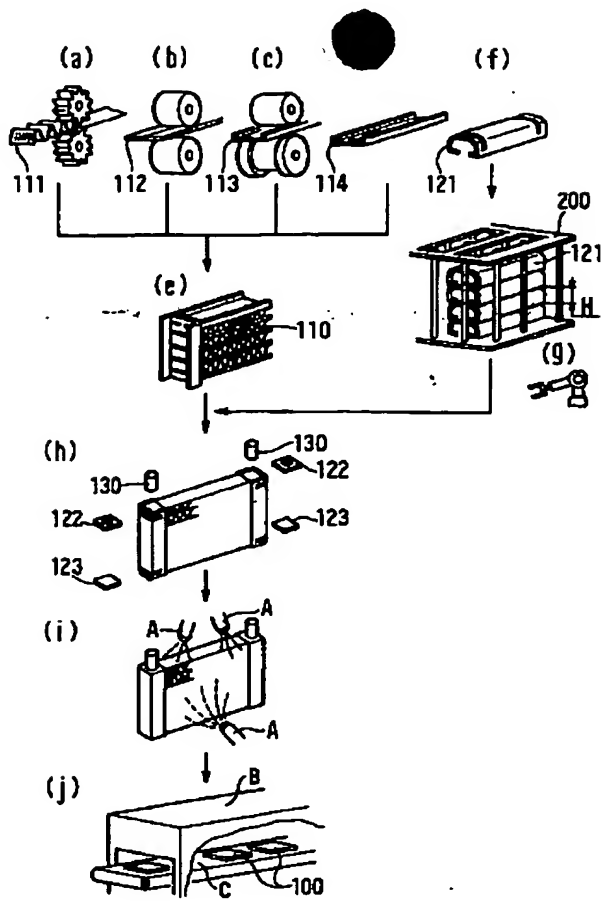
[Drawing 2]



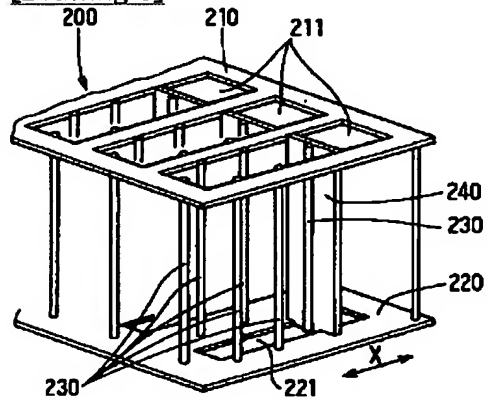
[Drawing 3]



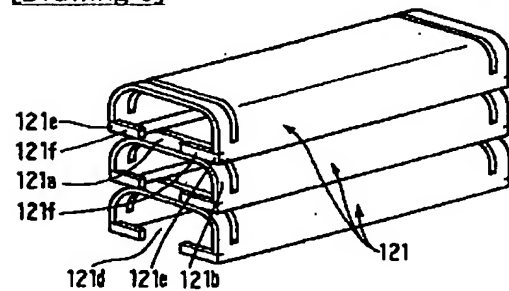
[Drawing 4]



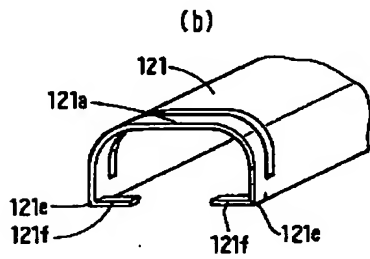
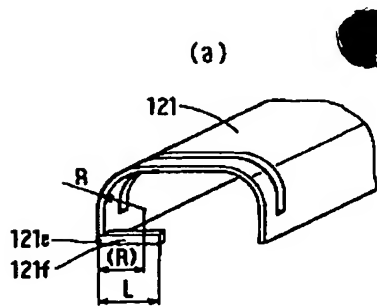
[Drawing 5]



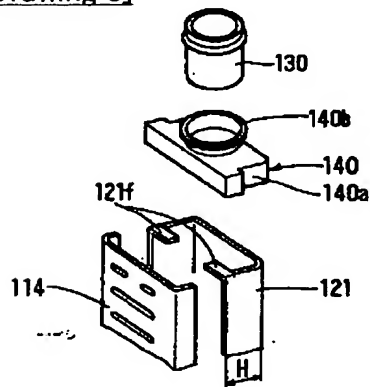
[Drawing 6]



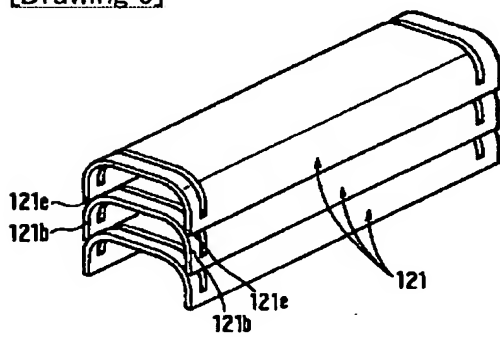
[Drawing 7]



[Drawing 8]



[Drawing 9]



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